

Department of Biological Sciences
MCMICKEN COLLEGE OF ARTS AND SCIENCES

SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: March 1, 2007

The Department of Biological Sciences is pleased to offer the following research project for the summer of 2007. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and if possible, develop a timetable for the twelve-week research period.

**Analysis of Ancient DNA from Sunflower (*Helianthus annuus* L.) Using
Microsatellite Genotyping**

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Project Description

With the advent of modern molecular techniques we are now able to address scientific questions that were heretofore unanswerable. When applied to the study of ancient DNA, molecular approaches have the potential to make unique and significant contributions to our understanding of the geographic origin and the wild ancestors of our valuable crop plants. This study includes an experiment to test whether a significant crop, sunflower (*Helianthus annuus* L.), was the product of multiple domestication events or whether it was domesticated once, then distributed throughout North America. A previous genetic study indicates a midwestern origin for domesticated sunflower, but early dates of archaeological sunflower in Mexico (1200 years before anything equivalent found in the U.S.) argue for a Mexican domestication event. How many domestication events were there? Where do the closest wild relatives of sunflower reside today? Results of this study will provide illuminating new insights into these questions. The purpose of this study is to test the hypothesis, using microsatellite DNA genotyping, that sunflower was domesticated in Mexico. Gene sequences from ancient DNA extracted from preserved sunflower plants found in archaeological sites in Mexico and the U.S. will be compared to extant wild and domesticated populations of sunflower to determine the likely centers of origin of the ancient domesticates. The proposed research project will not only have implications for our understanding of the trajectory of early cultures in the Americas, but it will help to identify closely-related wild populations of sunflower that may be useful for crop breeding purposes. In addition to the importance of this study to our understanding of the origins of agriculture and the genetic diversity of an essential

crop plant, it offers the potential of a new tool in the arsenal of botanical analysis: extraction and processing of ancient DNA from sunflowers, something never achieved before.